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ABSTRACT

These self-paced student training modules on linear measurement and whole numbers are two of a number of modules developed for Pre-apprenticeship Phase 1 Training. Purposes of the modules are to teach students the necessary math concepts in linear measurement to enable them to read and use those concepts; and to teach students the necessary math concepts in the addition, subtraction, multiplication, and division of whole numbers to enable them to compute math problems in which these concepts are used. The modules may contain some or all of the following: a cover sheet listing module title, goal, and performance indicator; study guide/checklist with directions for module completion; introduction; information sheets providing information and graphics covering the module topic(s); self-assessment; self-assessment answers; post assessment; and post-assessment answers. (YLB)

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INDIVIDUALIZED LEARNING SYSTEMS

PRE-APPRENTICESHIP PHASE 1 TRAINING

MATH

LINEAR MEASUREMENT

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Goal:

The student will know the necessary math concepts in linear measurement to enable him or her to read and use those concepts.

Performance Indicators:

Given a series of measurement problems in the Self Assessment and Post Assessment portions of this module, the student will be able to successfully compute the answers.

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Introduction

MATH

LINEAR MEASUREMENT

Fundamental to any industrial vocation is the measurement of linear or straight line distances. These measurements may be expressed in one of two systems. Apprentices for the most part still use the more familiar British system (of which the yard is the standard unit of length) although the metric is rapidly gaining popularity in the United States. The problems in this module will assume the use of the British system.

Study Guide

This study guide is designed to help you successfully complete this module. Check off the following steps to completion as you finish them.

STEPS TO COMPLETION

1. ____ Familiarize yourself with the Goal and Performance Indicators on the title page of this module.

2. ____ Read the Introduction and study the Information section of the module. It is intended to provide you with the math skills necessary to sucessfully complete the assessment portions.

3. ____ Complete the Self Assessment section of the module. You may refer to the Information section for help.

4. ____ Compare your Self Assessment answers with the correct answers on the Self Assessment Answer Sheet immediately following the Self Assessment exam. If you missed more than one of the Self Assessment exam questions, go back and re-study the necessary portions of the Information section, or ask your instructor for help. If you missed one or none of these problems, go on to step 5.

5. ____ Complete the Post Assessment section of the module. Show your answers to the instructor. It is recommeneded that you score 90% or better on those Post Assessment exams with 10 or more problems, or miss no more than one problem on those with fewer than 10 problems, before being allowed to go on the next math module.

Information

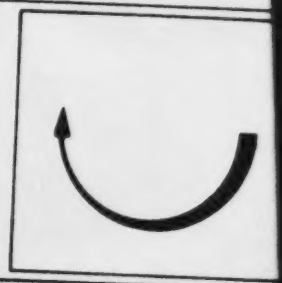


TABLE OF LINEAR MEASURE

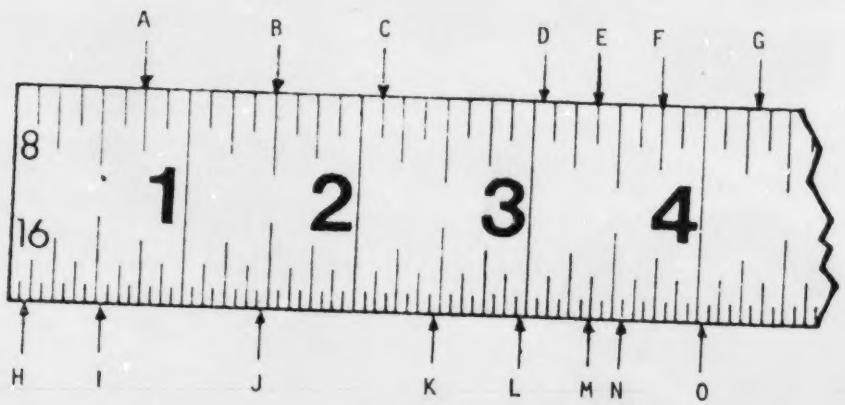
12 inches	=	1 foot
3 feet	=	1 yard
5 1/2 yards	=	1 rod
40 rods	=	1 furlong
8 furlongs	=	1 mile

Apprentices have as a basic tool, a steel rule that measures to the nearest one-thirty-second (1/32") of an inch. In most shops a tolerance of 1/32" is allowed im most measurements.

To read measurements, merely calculate where on the rule the mark falls.

Self Assessment

Read the distance from the start of the ruler to the letters A through O to the nearest 1/32"and place your answers in the assigned space below.



A= _____ F= _____ K= _____

B= _____ G= _____ L= _____

C= _____ H= _____ M= _____

D= _____ I= _____ N= _____

E= _____ J= _____ O= _____

Self Assessment Answers

A. 6/8 = 3/4

B. 1 1/2

C. 2 1/8

D. 3 1/16

E. 3 3/8

F. 3 3/4

G. 4 5/16

H. 3/32

I. 17/32

J. 1 15/32

K. 2 15/32

L. 2 31/32

M. 3 3/8

N. 3 9/16

O. 4 1/32

Post Assessment

Find the length of each of the following line segments to the nearest 1/32". (Always measure from the inside of end mark on the line segments.)

A)

B)

C)

D)

E)

A =

B =

C =

D =

E =

Draw a line segment equal to each of the following lengths to the nearest 1/32". Use the given end mark as the left end mark for the segment.

Example: 3"

A) 3 1/2"

B) 6 1/8"

C) 4 3/32"

D) 1 5/8"

E) 5 5/16"

F) 7/16"

G) 1/2"

H) 3/4"

I) 4/36"

J) 6/8"

INDIVIDUALIZED LEARNING SYSTEMS

MATH

WHOLE NUMBERS

Addition
Subtraction
Multiplication
Division

Goal:

The student will know the necessary math concepts in the addition, subtraction, multiplication, and division of whole numbers to enable him or her to compute math problems in which these concepts are used.

Performance Indicators:

Given a series of math problems in the Self Assessment and Post Assessment portions of this module, the student will be able to successfully compute the answers.

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Introduction

If an apprentice in any of today's skilled trades is to achieve his or her goal of becoming a top-flight journeyman, he or she must have a good working knowledge of basic mathematics. Problems involving common and decimal fractions, percent, ratio and proportion, compound numbers, and areas and volumes are regularly encountered in the trades. Because of their importance to the apprentice, these basic concepts are taken up in turn in subsequent modules of this unit. The present module provides a review of the addition, subtraction, multiplication and division of whole numbers--numbers that do not contain fractions and that are not in themselves fractions.

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Information

WHOLE NUMBERS

A whole number is any one of the natural numbers such as 1, 2, 5, etc. Numbers represent quantities of anything. They can be added, subtracted, multiplied or divided.

ADDITION

Addition is the process of combining two or more quantities (numbers) to find a total. The total is called the sum. Addition is indicated by the plus (+) sign and may be written as 2 + 2. The sum may be indicated by using the equal (=) sign. Example: 2 + 2 = 4. Another way of writing the same thing showing the sum of 4 is:

$$\begin{array}{r} 2 \\ +\ 2 \\ \hline 4 \end{array}$$

The following problem is included to refresh your memory of basic addition in trade terms.

ADDITION PROBLEM

Three bricklayers working together on a job each laid the following number of brick in one day. First bricklayer laid 887, second bricklayer laid 1123, and the third bricklayer laid 1053 brick. How many brick did all three lay that day?
Answer: 887 + 1123 + 1053 = 3063 brick

SUBTRACTION

Subtraction is the process of taking something away from the total. The portion which is left after taking some away is called the difference. The sign which indicates that one quantity (number) is to be subtracted from another is the minus (-) sign. Example: 6 - 4. In this example, 4 is being subtracted from 6. The difference is 2 or 6 - 4 = 2. Another way of writing the same thing is:

$$\begin{array}{r} 6 \\ -\ 4 \\ \hline 2 \end{array}$$

SUBTRACTION PROBLEM

A mason ordered 75 bags of cement and used 68 bags on the job. How many bags of cement were left?

Answer: 75 - 68 = 7 bags

MULTIPLICATION

Multiplication is the process of repeated addition using the same numbers. For example, if 2 + 2 + 2 + 2 + 2 were to be summed, the shortest method would be to multiply 5 times 2 to get the total of 10. The sign used to indicated multiplication is the times (x) sign. In the previous example, 5 times 2 equals 10, would be written 5 x 2 = 10. This may also be written as:

$$\begin{array}{r} 2 \\ \times\ 5 \\ \hline 10 \end{array}$$

MULTIPLICATION PROBLEMS

If a bricklayer can lay 170 brick an hour, how many brick would be laid in four hours?

Answer: 170 x 4 = 680 brick

One type of brick cost $9 per hundred. If 14,000 brick were ordered, how much would they cost?

Answer: $9 x 140 = $1260. Note: The brick were 9¢ each, $9 per hundred or $90 per thousand. Therefore, the answer could have been determined by multiplying 9¢ x 14,000, $90 x 14 or $9 x 140.

DIVISION

Division is the process of finding how many times one number is contained within another number. The division symbol is (÷). For example, when we wish to find how many times 3 is contained in 9, we say 9 divided by 3 equals 3 or 9 ÷ 3 = 3. The answer is called the quotient. If a number is not contained in another number an equal number of times, the amount left over is called the remainder. The following

problem illustrates such a situation: $9 \div 4 = 2$ with 1 left over. For purposes of calculation, the problem is generally written this way:

$$4\overline{)9}\ \begin{matrix}2\\8\\\hline 1\end{matrix}$$ or 2 1/4 remainder

DIVISION PROBLEMS

If a set of steps had 8 risers and the total height of all the steps (total rise) was 56 in., what would the height of each step be?

Answer: $8\overline{)56}$ or 7 in.

If a brick veneer wall requires five brick to lay up 1 sq. ft., how many square feet would 587 cover?

Answer: 117 2/5 sq. ft. of wall

$$5\overline{)587}\ \begin{matrix}117\\5\\\hline 8\\5\\\hline 37\\35\\\hline 2\end{matrix}$$

Self Assessment

Listed below each problem are four possible answers. Decide which of the four is correct, or most nearly correct; then write the letter for that answer in the blank space to the left of the problem.

1. ____ The estimated cost of a roof on a small building was $1,553. The actual cost was $1,395. What was the amount saved?

   a. $146
   b. $158
   c. $168
   d. $185

2. ____ A contractor buys 637 ft. of eaves trough for a four-family apartment. On completion of the job, he finds he has 48 ft. of the trough left. How many feet of the material has been used?

   a. 569
   b. 578
   c. 589
   d. 598

3. ____ A contractor buys 400 sacks of rock for three different jobs. On the first job he uses 78 sacks; on the second, 85 sacks; and on the third, 205 sacks. How many sacks are left?

   a. 30
   b. 31
   c. 32
   d. 33

4. ____ A contractor's bid on a school building is $78,265. When one wing is omitted to cut costs, he is able to cut his bid by $16,228. What is the new figure?

   a. $60,039
   b. $61,038
   c. $62,037
   d. $63,063

5. ____ If a dealer gets a shipment of 24,000 lbs. of tile, how many tons does he receive?

   a. 12
   b. 24
   c. 120
   d. 240

6. ____ A roofer works 40 hours at $3.00 per hour and 10 hours at $4.00 per hour. How much does the roofer earn?

   a. $140
   b. $150
   c. $160
   d. $170

7. ____ If a bundle of rock lath weighs 35 lbs. and it is permissible to place 700 lbs. on any one area on a floor, how many bundles can be placed on any one area?

a. 20
b. 22
c. 24
d. 28

8. ____ If 5 lbs. of putty are required to install one light of glass, how many lights can be installed with 85 lbs?

a. 16
b. 17
c. 18
d. 19

Self Assessment Answers

1. b
2. c
3. c
4. c
5. a
6. c
7. a
8. b

SELF ASS
ANSWHT

1 = b

2 = c

3 = c

4 = c

5 = A

6 = c

7 = A

8 = b

Post Assessment

Listed below each problem are four possible answers. Decide which of the four is correct, or most nearly correct; then write the letter for that answer in the blank space to the left of the problem.

1. ____ 686 + 240 + 1,320 + 16 + 400 =

   a. 2,452 c. 2,662
   b. 2,653 d. 2,762

2. ____ 16 + 480 + 26 + 15 + 6,000 =

   a. 6,436 c. 6,536
   b. 6,437 d. 6,537

3. ____ 29 + 15 + 24 + 13 + 10 =

   a. 90 c. 92
   b. 91 d. 93

4. ____ 280 - 116 =

   a. 154 c. 164
   b. 163 d. 174

5. ____ 40 - 16 =

   a. 21 c. 23
   b. 22 d. 24

6. ____ 220 - 38 =

   a. 172 c. 181
   b. 173 d. 182

7. ____ 292 x 16 =

   a. 3,573 c. 4,672
   b. 3,772 d. 4,772

8. ____ 460 x 15 =

   a. 5,900 c. 7,900
   b. 6,900 d. 8,900

9. ____ $24 \div 6 =$

a. 2
b. 4
c. 6
d. 8

10. ____ $180 \div 5 =$

a. 32
b. 34
c. 36
d. 38